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EXAMINER

NGUYEN, TOAN D

ART UNIT	PAPER NUMBER
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2665

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DATE MAILED: 08/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/588,619

Applicant(s)

DALLY ET AL.

Examiner

Toan D Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 June 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-71 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-71 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4,5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 112***

1. Claims 32 and 71 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 32 line 8, it is unclear as to what is meant by "further scheduler". Similar problems exist in claim 71 line 8.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-5, 8-9, 11, 14-15, 23, 25, 28, 32-38, 41-42, 44, 47-48, 56, 58, 61, 65-67 and 69-71 are rejected under 35 U.S.C. 102(e) as being anticipated by Li et al. (U.S. Patent 6,560,230 B1).

For claim 1, Li et al. disclose packet scheduling methods and apparatus comprising:

queues 55 storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and

a scheduler 50 which selects queues 55 from which packets are forwarded (figure 5, col. 4 lines 36-49 and col. 8 lines 34-36), the scheduler comprising:

scheduling values associated with the queues (col. 8 lines 34-41); and

a selection network by which the scheduling values are compared to select packets to be forwarded (figure 5A, col. 4 lines 36-49, col. 9 line 61 to col. 9 line 34 and col. 19 lines 51-64).

For claim 2, Li et al. disclose wherein the selection network is a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure (figures 4 and 7, col. 7 lines 23-24 and col. 14 lines 35-57).

For claim 3, Li et al. disclose wherein the scheduler limits comparisons of scheduling values to a path through the tree structure from a leaf node representing a changed scheduling value to a root of the tree structure (col. 12 lines 40-59).

For claim 4, Li et al. disclose wherein the internal nodes of the tree structure store scheduling values from winning sibling nodes (figure 6, col. 11 lines 35-45).

For claim 5, Li et al. disclose wherein the internal nodes store identities of leaf nodes corresponding to the stored scheduling values (figure 5A, col. 8 line 61 to col. 9 line 26).

For claim 8, Li et al. disclose wherein the scheduler comprises pipeline stages, each of which compares scheduling values indicated by separate portions of the tree structure (figure 4, col. 12 lines 40-59).

For claim 9, Li et al. disclose wherein the scheduler comprises a random access memory partitioned across the pipeline stages, each partition storing at least one level of the tree structure (figure 5A, col. 8 line 61 to col. 9 line 6).

For claim 11, Li et al. disclose wherein each node identifies a path to a winning leaf node (col. 9 lines 7-34).

For claim 14, Li et al. disclose wherein the scheduling values include scheduled transmission times according to a constant-bit-rate (CBR) service guarantee (figure 4, col. 7 lines 25-35).

For claim 15, Li et al. disclose wherein the scheduling values are updated to reflect variable packet links (figure 7, col. 14 lines 61-62).

For claim 23, Li et al. disclose wherein the selection network is a sorting network by which the scheduling values are compared to order the queues by scheduling priority (col. 6 lines 47-58).

For claim 25, Li et al. disclose packet scheduling methods and apparatus comprising:  
queues storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and  
a scheduler which selects queues from which packets are forwarded (figure 5, col. 4 lines 36-49 and col. 8 lines 34-36), the scheduler comprising:

first scheduling values corresponding to a first scheduling method associated with a first subset of queues (figure 5A, col. 9 lines 7-26);

second scheduling values corresponding to a second scheduling method associated with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues (figure 5A, col. 9 lines 7-26); and

a queue selector by which first scheduling values are compared and second scheduling values are compared to select packets to be forwarded (col. 9 lines 27-34 and col. 11 lines 35-45).

For claim 28, Li et al. disclose packet scheduling methods and apparatus comprising:

queues storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and

a scheduler which selects queues from which packets are forwarded (figure 5, col. 4 lines 36-49 and col. 8 lines 34-36), the scheduler comprising:

scheduling values associated with the queues (col. 8 lines 34-41);

a selector by which scheduling values are compared to select packets to be forwarded (col. 9 lines 27-34 and col. 11 lines 35-45); and

a scheduling value updater which updates the scheduling value of a queue based on a variable length of a packet in the queue (figure 7, col. 14 lines 61-62 and col. 14 lines 1-9).

For claim 32, Li et al. disclose packet scheduling methods and apparatus comprising:

a first set of queues storing data packets to be forwarded (figures 5A, col. 9 lines 7-26);

a first scheduler which selects queues of the first set of queues from which packets are forwarded to a first intermediate queue (col. 9 lines 27-34);

a second set of queues storing data packets to be forwarded (figures 5A, col. 9 lines 7-26);

a second scheduler which selects queues of the second set of queues from which packets are forwarded to a second intermediate queue (col. 9 lines 27-34); and

a further scheduler which selects intermediate queues from which packets are forwarded (figure 8, col. 13 line 35 to col. 9).

For claim 33, Li et al. disclose wherein the first scheduler selects queues according to plural scheduling methods (figure 8, col. 13 line 35 to col. 9).

For claim 34, Li et al. disclose packet scheduling methods and apparatus comprising:

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storing data packets in queues (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48);

associating scheduling values with the queues (col. 8 lines 34-41); and

comparing scheduling values in a selection network to select queues from which packets are forwarded (figure 5A, col. 4 lines 36-49, col. 9 line 61 to col. 9 line 34 and col. 19 lines 51-64).

For claim 35, Li et al. disclose wherein the selection network is a tree structure where each leaf of the tree structure represents a scheduling value of a queue and internal nodes of the tree structure represent winners in comparisons of scheduling values of sibling nodes of the tree structure (figures 4 and 7, col. 7 lines 23-24 and col. 14 lines 35-57).

For claim 36, Li et al. disclose wherein the scheduler limits comparisons of scheduling values to a path through the tree structure from a leaf node representing a changed scheduling value to a root of the tree structure (col. 12 lines 40-59).

For claim 37, Li et al. disclose wherein the internal nodes of the tree structure store scheduling values from winning sibling nodes (figure 6, col. 11 lines 35-45).

For claim 38, Li et al. disclose wherein the internal nodes store identities of leaf nodes corresponding to the stored scheduling values (figure 5A, col. 8 line 61 to col. 9 line 26).

For claim 41, Li et al. disclose comparing scheduling values indicated by separate portions of the tree structure in pipeline stages (figure 4, col. 12 lines 40-59).

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For claim 42, Li et al. disclose storing at least one level of the tree structure in a partition of a random access memory (RAM) partitioned across the pipeline stages (figure 4, col. 12 lines 40-59).

For claim 44, Li et al. disclose wherein each node identifies a path to a winning leaf node (col. 9 lines 7-34).

For claim 47, Li et al. disclose wherein the scheduling values include scheduled transmission times according to a constant-bit-rate (CBR) service guarantee (figure 4, col. 7 lines 25-35).

For claim 48, Li et al. disclose wherein the scheduling values are updated to reflect variable packet lengths (figure 8, col. 14 lines 1-9)

For claim 56, Li et al. disclose wherein the selection network is a sorting network by which the scheduling values are compared to order the queues by scheduling priority (col. 6 lines 47-58).

For claim 58, Li et al. disclose packet scheduling methods and apparatus comprising:  
storing data packets in queues (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48);

associating scheduling values corresponding to a first scheduling method with a first subset of queues (col. 9 lines 27-34);

associating scheduling values corresponding to a second scheduling method with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues (col. 9 lines 27-34); and



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comparing scheduling values to select packets to be forwarded, excess capacity under the first scheduling method being available for scheduling under the second scheduling method (figure 7, col. 14 lines 44-57).

For claim 61, Li et al. disclose packet scheduling methods and apparatus comprising:  
storing data packets in queues (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48);

associating scheduling values with the queues (col. 9 lines 27-34);

comparing scheduling values to select data packets to be forwarded (col. 9 lines 27-34 and col. 11 lines 35-45); and

updating the scheduling value of a queue based on a variable length of a packet in the queue (figure 7, col. 14 lines 61-62 and col. 14 lines 1-9).

For claim 65, Li et al. disclose packet scheduling methods and apparatus comprising:  
storing data packets to be forwarded in first and second sets of queues (figures 5A, col. 9 lines 7-26);

selecting queues of the first set of queues from which packets are forwarded to a first intermediate queue;

selecting queues of the second set of queues from which packets are forwarded to a second intermediate queue (col. 9 lines 27-34); and

selecting intermediate queues from which packets are forwarded (figure 5A, col. 4 lines 36-49, col. 9 line 61 to col. 9 line 34 and col. 19 lines 51-64).

For claim 66, Li et al. disclose wherein the step of selecting queues of the first

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set of queues comprises selecting queues according to plural scheduling methods (figure 8, col. 13 line 35 to col. 9).

For claim 67, Li et al. disclose packet scheduling methods and apparatus comprising:  
queues storing data packets to be forwarded queues 55 storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and  
scheduling means for selecting queues from which packets are forwarded the scheduling means comprising:

scheduling values associated with the queues (col. 8 lines 34-41); and  
a selection network by which the scheduling values are compared to select packets to be forwarded (figure 5A, col. 4 lines 36-49, col. 9 line 61 to col. 9 line 34 and col. 19 lines 51-64).

For claim 69, Li et al. disclose packet scheduling methods and apparatus comprising:  
queues storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and  
scheduling means for selecting queues from which packets are forwarded, the scheduling means comprising:

first scheduling values corresponding to a first scheduling method associated with a first subset of queues (col. 9 lines 27-34);

second scheduling values corresponding to a second scheduling method associated with a second subset of queues, at least one queue being a member of each of the first subset and second subset of queues (col. 9 lines 27-34);; and

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queue selecting means for comparing first scheduling values and second scheduling values to select packets to be forwarded (figure 5A, col. 4 lines 36-49, col. 9 line 61 to col. 9 line 34 and col. 19 lines 51-64).

For claim 70, Li et al. disclose packet scheduling methods and apparatus comprising:  
queues storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and

scheduling means for selecting queues from which packets are forwarded, the scheduling means comprising:

scheduling values associated with the queues (col. 8 lines 34-41);  
selecting means for comparing scheduling values to select packets to be forwarded (col. 9 lines 27-34 and col. 11 lines 35-45); and

updating means for updating the scheduling value of a queue based on a variable length of a packet in the queue (figure 7, col. 14 lines 61-62 and col. 14 lines 1-9).

For claim 71, Li et al. disclose packet scheduling methods and apparatus comprising:  
a first set of queues storing data packets to be forwarded (figures 5A, col. 9 lines 7-26);  
first scheduling means for selecting queues of the first set of queues from which packets are forwarded to a first intermediate queue (col. 9 lines 27-34);

a second set of queues storing data packets to be forwarded (figures 5A, col. 9 lines 7-26);

second scheduling means for selecting queues of the second set of queues from which packets are forwarded to a second intermediate queue (col. 9 lines 27-34); and

further scheduling means for selecting intermediate queues from which packets are forwarded (figure 8, col. 13 line 35 to col. 9).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 6-7, 10, 12-13, 16-22, 24, 26-27, 29-31, 39-40, 43, 45-46, 49-55, 57, 59-60, 62-64 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (U.S. Patent 6,560,230 B1) in view of Lauer et al. (U.S. Patent 5,455,825).

For claim 24, Li et al. disclose packet scheduling methods and apparatus comprising:  
queues storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and

a scheduler which selects queues from which packets are forwarded (figure 5, col. 4 lines 36-49 and col. 8 lines 34-36), the scheduler comprising:

scheduling values associated with the queues (col. 8 lines 34-41).

However, Li et al. do not disclose indicators associated with the queues to disable the queues; and a comparator which compares scheduling values of queues which are not disabled to forward data packets therefrom. In an analogous art, Lauer et al. disclose indicators associated with the queues to disable the queues (figure 2B, col. 7 lines 39-50); and a comparator which compares scheduling values of queues which are not disabled to forward data packets therefrom (col. 7 lines 58-66).

Lauer et al. in view of Li et al. disclose further wherein the scheduler comprises a random access memory (RAM) for storing the tree structure, an address register which stores an address to access from the RAM a scheduling value to be compared, a compare register which stores a scheduling value to be compared to the scheduling value from the RAM and a comparator for comparing the scheduling values (col. 7 lines 58-66 as set forth in claims 6 and 39); wherein the scheduler further comprises hardware which receives the address in the address register and determines a sibling node where a scheduling value to be compared is stored, and determines a parent node address at which a winning compared scheduling value is stored (figure 3, col. 8 lines 51-63 as set forth in claims 7 and 40); wherein the scheduler further comprises in each pipeline stage an address register which stores an address to access from the RAM a scheduling value to be compared, a compare register which stores a scheduling value to be compared to a scheduling value from the RAM and a comparator for comparing the scheduling values (figure 3, col. 8 lines 51-63 as set forth in claims 10 and 43); a random access memory which stores leaf nodes, a flip-flop array which identifies the winner at each internal node and a comparator for comparing scheduling values of the leaf nodes from the RAM indicated by the data stored in the

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flip-flop array (figure 2B, col. 7 lines 36-66 and col. 8 lines 51-63 as set forth in claims 12 and 45); an indicator associated with each queue to disable the queue from scheduling (col. 7 lines 36-66 as set forth in claims 13 and 46); wherein the scheduling values are updated to reflect byte stuffing applied to a prior packet (col. 4 lines 14-25 as set forth in claims 16, 19, 22, 29, 49, 52, 55 and 62); scheduling values which represent theoretical transmission times using a weighted-fair-queuing (WFQ scheduling policy) (col. 13 lines 37-43 as set forth in claims 17 and 50); the VWFQ scheduling values are updated for variable packet lengths (col. 13 lines 49-51 as set forth in claims 18, 51 and 54); scheduling values which represent theoretical transmission times using a weighted-fair-queuing (WFQ scheduling policy) (col. 13 lines 37-43 as set forth in claims 20 and 53); wherein the WFQ scheduling values are updated for variable packet lengths (col. 13 lines 49-51 as set forth in claim 21); wherein the first scheduling method is constant bit rate (CBR) scheduling and the second scheduling method is weighted-fair-queuing (WFQ scheduling) (col. 13 lines 37-43 and col. 14 lines 19-21 as set forth in claims 26 and 59); identifying an earliest scheduled CBR queue; if the scheduling value of the identified CBR queue is less than or equal to a current time, transmitting a corresponding packet from the CBR queue and updating the CBR scheduling value associated with the queue; and otherwise, transmitting a packet from a WFQ queue having an earliest scheduling value and updating the scheduling value of that queue (col. 14 lines 19-32 as set forth in claims 27, 30-31, 60 and 63-64).

One skilled in the art would have recognized indicators and comparator to use the teachings of Lauer et al. in the system of Li et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time invention, to use the indicators and comparator as taught by

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Lauer et al. in Li et al.'s system with the motivation being perform a simple prioritization function with exactly two priorities (col. 7 lines 50-51).

For claim 57, Li et al. disclose packet scheduling methods and apparatus comprising:  
storing data packets in queues (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48);

associating scheduling values with the queues (col. 8 lines 34-41);

However, Li et al. do not disclose associating indicators with the queues to disable the queues; and comparing scheduling values of queues which are not disabled before the data packets therefrom. In an analogous art, Lauer et al. disclose indicators associated with the queues to disable the queues (figure 2B, col. 7 lines 39-50); and a comparator which compares scheduling values of queues which are not disabled to forward data packets therefrom (col. 7 lines 58-66). One skilled in the art would have recognized indicators and comparator to use the teachings of Lauer et al. in the system of Li et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time invention, to use the indicators and comparator as taught by Lauer et al. in Li et al.'s system with the motivation being perform a simple prioritization function with exactly two priorities (col. 7 lines 50-51).

For claim 68, Li et al. disclose packet scheduling methods and apparatus comprising:  
queues storing data packets to be forwarded (figures 5 and 6, col. 4 lines 31-32, col. 8 lines 34-41 and col. 19 lines 47-48); and

scheduling means for selecting queues from which packets are forwarded, the scheduling means comprising:

scheduling values associated with the queues (col. 8 lines 34-41).

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However, Li et al. do not disclose indicating means associated with the queues for disabling the queues; and comparator means for comparing scheduling values of queues which are not disabled to forward data packets therefrom. In an analogous art, Lauer et al. disclose indicators associated with the queues to disable the queues (figure 2B, col. 7 lines 39-50); and a comparator which compares scheduling values of queues which are not disabled to forward data packets therefrom (col. 7 lines 58-66). One skilled in the art would have recognized indicators and comparator to use the teachings of Lauer et al. in the system of Li et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time invention, to use the indicators and comparator as taught by Lauer et al. in Li et al.'s system with the motivation being perform a simple prioritization function with exactly two priorities (col. 7 lines 50-51).

***Contact Information***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toan D Nguyen whose telephone number is 703-305-0140. The examiner can normally be reached on Monday- Friday (7:00AM-4:30PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Huy Vu can be reached on 703-308-6602. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

TN  
T.N.



ALPUS H. HSU  
PRIMARY EXAMINER